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Cardiff Road
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NP10 8QQ

1. Your reference — GW-9253-GB

2. Patent application number *(The Patent Office will fill in this part)* — 0403109.2

12 FEB

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Hesco Bastion Ltd
Unit 37
Knowsthorpe Gate
Cross Green Industrial Estate
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LS9 0NP

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation — England 6201826001

4. Title of the invention — Apparatus for the Creation of Outer Surfaces for Structures

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

~~Bailey Walsh & Co~~
~~5 York Place~~
~~Leeds~~
~~LS1 2SD~~

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COOPERS BUILDING
CHURCH STREET.
LIVERPOOL
L1 3AB

Patents ADP number *(if you know it)*

~~224001~~

158001

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

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Patents Form 1/77

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Continuation sheets of this form	
Description	13
Claim *(s)*	
Abstract	
Drawing *(s)*	5 + 5 R

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Priority documents	
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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature [signature] Date 11.02.04

12. Name and daytime telephone number of person to contact in the United Kingdom

G Wood
0113 243 3824

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Apparatus for the Creation of Outer Surfaces for Structures

This invention relates to apparatus for the creation of outer surfaces having certain effects for structures.

In European Patent No. 0466726, there is set forth a cage structure useful in connection with the creation of building blocks, which can be used for sea defences, shoring hillsides, and for providing military defence walls. These structures are made of open mesh panels, for example of welded mesh material, or twisted wire construction. The advantage of the structure set forth is that the panels are used to form the walls of the structure, with the panels being pivotally connected under factory conditions and the structure can be folded to a flat collapsed condition for transportation to site. On site, simply by manipulation, the structure is capable of being moved from the collapsed condition to an erected condition, in which the structure defines a row of open topped cavities which can be filled with soil, sand, rubble or the like to form a wall (or part thereof), shoring block or the like. The invention has been successful commercially on a worldwide basis.

A problem which has been encountered is that in certain climates, particularly hot climates, the material which is used to fill the cavities formed by the panels can be susceptible to changing conditions under temperature extremes. For example the material may be caused to contract in cold weather or expand in hot weather which can cause the structure to be less rigid or threaten to "burst" the joins between the panels.

A further problem is that in certain instances it can be desirable to provide a building structure with a particular surface effect, which it might not otherwise have from the material used to fill the cavities.

It should be clear that the invention can be applied to other building structures and situations. This should be borne in mind despite the fact that in the following a structure of the type described in the applicant's patent EP0466726 is given as a particular embodiment of the invention.

In a collapsible/erectable structure it is difficult to give the walls, or one wall a different surface effect than would be achieved as a result of the materials used for the structure and the filling material. It is disclosed in the said patent that when the structure is erected and filled, the walls can be given a different surface effect by the spraying of decorative synthetic resin onto the walls of the erected structure. However, should it be that the walls were to have a different surface effect, say of turf or of other vegetation effect, or a surface effect for a protective purposes that could not be achieved with the structure specifically described in the said patent.

The present invention seeks to provide an apparatus whereby an outer surface can be provided, which is other than the surface which would be achieved without the invention with the surface effect located being of advantage from an appearance effect and/or in controlling the condition of the building structure.

In accordance with the invention there is provided an apparatus for creating an outer surface of a structure wherein at least one wall of the structure defines a support surface, means defining a covering surface which overlies the support surface but is movable therefrom, so that a quantity of material to create the outer surface can be positioned between the support surface and the covering surface, and wherein the covering surface is in the form of a panel.

Typically the panel is a mesh panel through which the said surface affect material can be viewed.

Preferably, the structure is defined by a series of mesh panels, and the edges of the cover panel are connected to the edges of the support mesh panel by means of elongated, coiled wire connectors threaded round the edges of the mesh panels at a pair of opposite edges of such panels, or threaded about intermediate spacing panels which serve to space the outer panels from the support of the structure.

In one embodiment, the cover panels can be pivoted away from the support panel, or be removed therefrom to a sufficient extent to allow a cavity to be formed for the reception of the material to create the outer surface. The material can for example be a layer of turf or other horticultural vegetation, or decorative wood planks, board, or wooden fencing members (such as chestnut fencing poles), rocks, boulders, gravel to be placed on the support panel, or within the cavity. The cover panel can if required be positioned to retain the said material and again if required be connected, by re-threading the coiled wire connector through the edges of the cover and support panels, to trap the material in position between the panels. The cover panel may be detached completely by removing both coiled wire connectors, or if the cover panel is mounted so as to lie spaced from the support panel to a sufficient extent, then the material may be positioned between the panels without removing the cover panel.

The support panel may be a wall panel of a collapsible structure as described above. Indeed, and as can be expected, all of the wall panels of one or both sides of such a structure may be provided with a surface effect as set forth above. The outer surfaces for the

individual wall panels will usually be the same, but they could be different as desired. The invention also extends to a structure as described above, but wherein the various panels, or at least some of them are delivered to site, and the structure is erected on site by connecting the panels together, the outer surface being added after erection of the structure, or in an alternative arrangement, each support panel and its cover panel may be pre connected and constructed to receive the material to form the outer surface therebetween.

Where the outer surface is created by growing material, this may eventually grow to such an extent as to conceal the cover panel mesh, and so using the collapsible structures mentioned above, could provide a quick means of erecting say a grassy bank, or a boundary hedge wall, which would have a natural look, without the need for any excavation. The invention therefore has considerable advantages.

A further advantage is that by selecting the appropriate material to form the outer surface, so heat insulation can be achieved by the said material thereby preventing adverse effects from the heat on the structure or the filling material or on other items adjacent the structure.

Typically, each or selected sides of the structure can be provided with the panels thereby allowing an outer surface to be created on all or selected sides of the structure. In addition, the material used t form the outer surface can also be positioned on the top of the structure to form an outer surface thereon.

In a further aspect of the invention there is provided a structure comprising a series of interconnected side panels forming a cavity

for the reception of filling material therein to form a building structure having opposing side walls and end walls and wherein additional panels are provided along at least the side walls, externally thereof and joined to the same but spaced apart to form respective first and second cavities for the reception of material which differs to the filling material and form outer surfaces along at least the side walls.

In one embodiment the material used has better insulating characteristics than the filling material.

By way of explanation, an embodiment of the invention, with modifications, is illustrated in the accompanying diagrammatic drawings, and is explained in the description which follows.

In the drawings,

Fig. 1 shows in perspective view, a wall created by collapsible/erectable structures as described herein;

Fig. 2 is an exploded perspective view of the parts defining one cavity of one of the structures shown in Fig. 1;

Fig. 3 is an elevation view of one of the structures of Fig. 1, to show how it can be folded to the collapsed position;

Fig. 4 is a perspective view of the wall of Fig. 1, but showing the cover panels attached, to form a structure according to the embodiment of the invention;

Fig. 5 is a view similar to Fig. 2, but shows a modification;

Fig. 6 is a view similar to Fig. 4, but showing the wall with the surface effect layers in position;

Fig. 7 is a view similar to Fig. 2, but showing a further modification;

Fig. 8 is a cross sectional view taken on the line X-X in Fig. 6, showing the support mesh, the cover mesh panel and the surface effect layer;

Figs. 9 and 10 respectively are views to show two of the many different types of surface effect layer which can be used;

Fig. 11 is a plan view of a collapsible/erectable structure of a different type which can be used; and

Fig. 12 is a plan of the structure shown in Fig. 11, to illustrate how it can be folded to the collapsed condition.

In Fig. 1 a wall 10 made up of three conventional collapsible/erectable structures of the type described herein and superimposed one upon the other as shown. The structures are illustrated by the reference numerals 12, 14 and 16. In this example the structures are of trapezoidal cross-section so that the bottom one 12 is the broadest, whilst the top one 16 is the narrowest. The structures are made up of panels as described, and these panels are interconnected by means of coiled wire connectors 18, in known manner.

The structures 12, 14 and 16 have no top or bottom, so that each defines a row of cavities 20, 22, 24 and so on, and the structures can be of any appropriate length. Typically, the structure may be of 10 cavity length but this is not to be considered as limiting.

In a practical example, the inner surfaces of the panels of the structures 12, 14 and 16 are lined with a retaining material such as a geo-textile material so that when the structure cavities 20, 22 and 24 are filled with appropriate filling material such as soil, sand, rocks or other ballast, that material will not pass through the meshes of the panels, it being remembered that the panels making up the structure will normally be of welded mesh construction.

These structures and the features described are of course already known.

Fig. 2 shows typically how the panels are used in each structure to form one cavity of the structure. In Fig. 2 the panels shown form the cavity 20 of the top structure 16, and the panels comprise two similar mesh side panels 26 and 28, and two end panels 30 and 32, which comprise trapezoidal rod boundaries and intermediate parallel connecting rods, although this is still considered to be a mesh structure. Although shown in a trapezoidal form it should be appreciated that the structures can be cube or cuboid in shape. The panels 26 to 32 are connected by means of the coiled wire connectors 18, one of which is shown in greater detail in Fig. 2, but each of the axes 18A represents the position of one of these connectors. To connect the panels shown in Fig. 2, they are brought into the trapezoidal configuration shown in Fig. 1, and then the connectors 18 are spirally wound about the adjacent end bars of the panels so that each connector 18 embraces two bars of the respective adjacent panel edges. By this means, the panels are all pivotally connected together, and having regard to the diameter of the connector 18, so there is a relatively free pivotal movement and there is a certain amount of clearance so that the panel edges are free to move within the connectors.

Of the panels 30 and 32, if the panel 30 is at the end of a structure, it will be an end panel, but panel 32 will be common to the next cavity, and it is commonly known as a partition panel. The spiral connectors which connect panels 26 and 28 to panel 32 therefore also simultaneously embrace the next adjacent side panels of the next cavity, and so on.

It will be understood that the structures are therefore foldable by relative pivoting between the various panels, and Fig. 3 is included to show how the structures can be folded. Fig. 3 shows the top structure 16, and the additional panels making up cavity 22 are indicated by reference numerals 26A, 28A and 32A. To collapse the structure the alternate partition panels 30 and 32A are moved in opposite directions as indicated by the arrows 34 and 36 and so the whole structure can fold up zigzag or concertina fashion. Although the partition panels 32 and the end panels 30 are of trapezoidal form, there is sufficient clearance within the coil connectors 18 to allow complete folding to take place. Each of the structures 12, 14 and 16 is collapsible in the same way, and therefore can be folded up for transportation purposes.

The structures 12, 14 and 16 need not be of trapezoidal form, but this form is of particular advantage in relation to the utilisation of the present invention.

In the present invention, the outer surfaces of the panels of the structures shown in Fig. 1 are provided to receive material to form an outer surface to give the overall wall the appearance of having a surface of a material which is different from that which is typically placed in the cavity 20, 22, 24. Referring to Fig. 4, one embodiment is shown and in this embodiment, additional cover panels 40 to 50

are connected to the side panels of the structures as shown. These panels 40 to 50 are connected to the panels using the same connector coils 18 or in a modification, separate connector coils, and the coils connect so that the panels 40 to 50 are pivotable by virtue of being connected to these coils.

In order to provide the material to form the outer surface of the structure the panels 40 to 50 are pivoted clear of the side panels of the structures 12, 14 and 16, which side panels form support panels and the material can either be applied over the support panels as shown or placed into cavities defined between the support panels and cover panels. When the material is applied, the cover panels 40 to 50 are pivoted back onto the material, and are connected to each other by means of a coiled wire connector such as 18 at the free edges which are shown in Fig. 4 and which meet when the cover panels are placed into position. The coiled wire connectors which connect panels 40 and 46, 42 and 48, and 44 and 50, may be coupled to the existing coiled wire connectors connecting the structure side panels by the insertion of a connecting rod through the two coiled connectors which are moved sufficiently close so that the coils overlap, thereby trapping the surface effect material which is viewable through the panels 40 to 50 as these panels also are of mesh construction. The effect is in fact shown in Fig. 6, where the dashed line areas are intended to represent material which in this embodiment is turf, so that the wall eventually will have a turf surface appearance. This is applied over the whole of the wall surface.

Instead of placing turf between the support and cover mesh panels, other suitable horticultural material can be used such as the material known as "seedam" which is a material which is supplied as a thin layer and in rolls, and is simply unrolled and placed on the ground.

The layer comprises soil bound by means of a woven fabric, and the soil contains a seed material from which green vegetation grows.

Fig. 8 is included to show a section of this material, and in this figure the growing material is indicated at 52 as it grows through the cover panel 44, and the support panel 26 is also illustrated. Between the support panel and the cover panel is the fabric 54 which forms the binding for the material, and also illustrated is the soil layer 56. The Seedam material has roots which grow rearwards, and these are shown at 58 where they pass through the geo-textile material 60 on the inner side of support panel 26.

The Seedam material is so constructed that the soil and binding fabric will retain moisture enabling the vegetation 52 to grow efficiently, but the addition of the geo-textile material 60 provides a further means for the retention of moisture, and the invention therefore is of particular relevance to the effective growing of the Seedam material. The Seedam material provides an excellent green covering and growth is limited as compared for example to grass so that cutting of the Seedam material is not necessary and therefore it is particularly suitable for this application.

Instead of the panels 40 to 50 being pivotally mounted as shown in Fig. 4, they can be detachably mounted and the material for the outer surface can be mounted on the panels 40 to 50 and then the panels and the material applied as appropriate.

If reference is made to Fig. 5, modifications are shown therein to the end panel 30. At one side end panel is shown as having an extension wing 62 which forms a connecting bar for the coiled connectors. If the bar 62 is used for example for mounting the cover panels 40 to 50, then these panels 40 to 50 will be spaced

slightly further from the support panels of the structures so that thicker surface effect layers can be positioned between the panels. In this case the structure panel would be connected to rod portion 64, and the cover panel would be connected to rod portion 62.

Another modification shown in Fig. 5 is indicated that the opposite side of panel 30 and comprises an extension ladder 66. One rail 68 of that ladder would be coupled to the end panel rod portion 70 by a coiled connector, whilst the other rail 72 serves for the mounting of the cover panel. If either of these modifications is adopted, it would be adopted on each of the end and partition panels of the foldable structure.

Another modification of this character is shown in Fig. 7 where the side panels 26 and 28 are replaced by a frame 74, which serves to receive a mesh tray 76. The tray 76 has a mesh base and rod extension sides 78 and 80 and a base extension 82 of the form shown. The structure is built using the side panels 74, and when it is erected into a wall, the tray 76 is fitted for the receipt of the surface effect material which can be quite thick having regard to the height of the extensions 78 and 82. After the tray is fitted, and the surface effect material is inserted, a cover panel such as 40 to 50 is applied over the tray to retain the surface effect material. All or one or more of the side panels of the structures 12 to 16 may be constructed in this way.

Figs. 9 and 10 show how solid material may be used to form the outer surface and these are preferably used where the spacing between the support and cover panels is sufficient and these panels are held in spaced relationship.

In Fig. 9 it is shown that wooden planks 84 may be dropped in behind the cover panels or may be placed in the tray 76 of Fig. 7, whilst Fig. 10 shows that chestnut-fencing posts 86 may be used for creating the surface effect. In another arrangement, the surface effect is created by one or more metal plates

Figs. 11 and 12 are included to show that collapsible/erectable structures in accordance wit the invention may be of a different configuration from that shown in Figs. 4 to 10. In the arrangement of Fig. 11, additional pivot connections are provided at 90 in each side of the structure. These pivot connections are parallel to the other pivot connections on that side of the structure and again is created by a coiled wire connector. Each side of each cavity therefore is split into two equal sections which can pivot relative to one another during the collapsing and erecting operations of the structure.

Fig. 12 shows how the structure can be collapsed by pivoting the side sections outwardly so that the partition panels 30, 32, 32A and so on move together in the direction of the arrows 92 as shown in Fig. 12. In this arrangement material can be placed into the cavities 93 when the structure is in the erected condition shown in Figure 11, with the material placed therein forming the outer surface of the structure on both elongate side walls of the structure. For example, if it is desired that the outer surface which is formed has insulating properties, then material with such properties which are better than the material used to fill the main cavities 22, 24 and so on can be used to fill the cavities 93 and hence provide the insulating outer surfce. Such material could be rocks or the like and which therefore serve to insulate the structure as a whole. Furthermore, if required, the material used to form the outer surface of the elongate side walls can also be used to form the outer

surfaces of the end walls of the structure in cavities formed therein, in the same manner by the addition of the panels and/or the top of the structure by placing and, if necessary, securing the insulating material in position, and even the base of the structure by placing said material onto the surface prior to placing the structure thereon and then filling the same.

In this invention it is not necessary that the structures are erected in the factory. They could be erected on site, where some or all of the pivot connections are made, and the surface effect material could be inserted in the erected structure on site or it could be supplied between the support and cover panels and supplied as panel units.

The invention provides that an outer surface on the side walls of the structure can be created by using a covering mesh panel, where such effects either visual and/or protective would not normally exist. The invention has particular application to the collapsible type structures discussed herein, and can be used to maintain the characteristics of the same in extreme environmental conditions by preventing expansion or contraction and hence improving the safety of the structures as required.

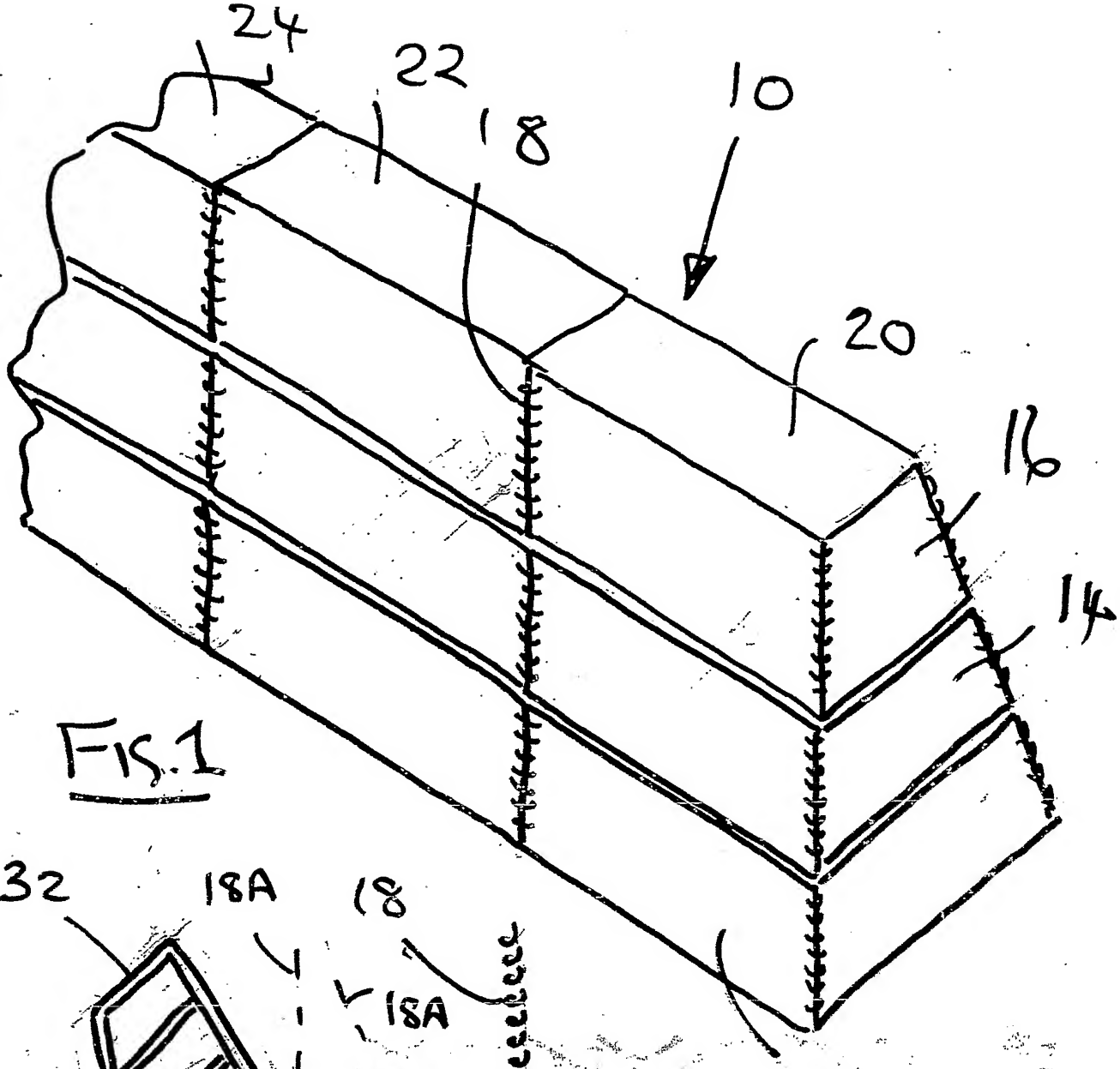

FIG. 1

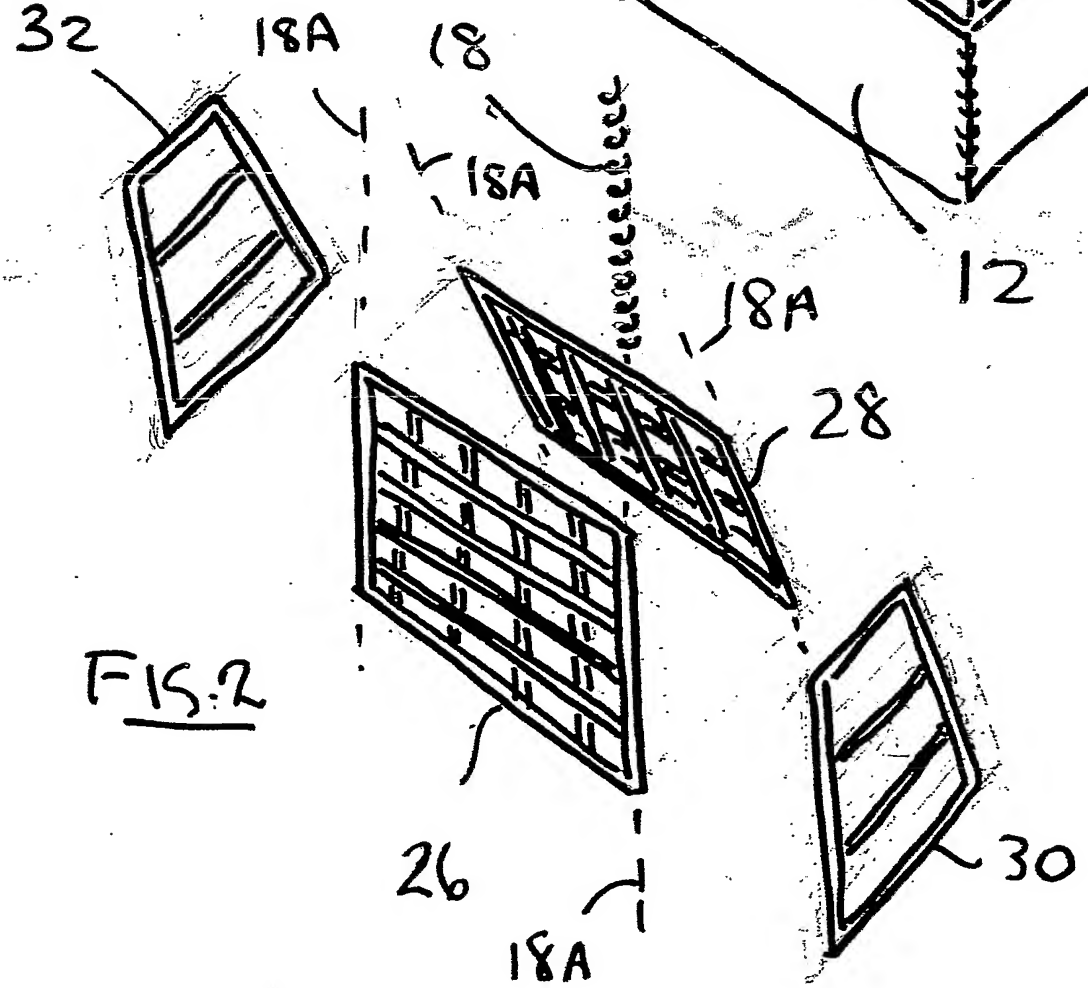

FIG. 2

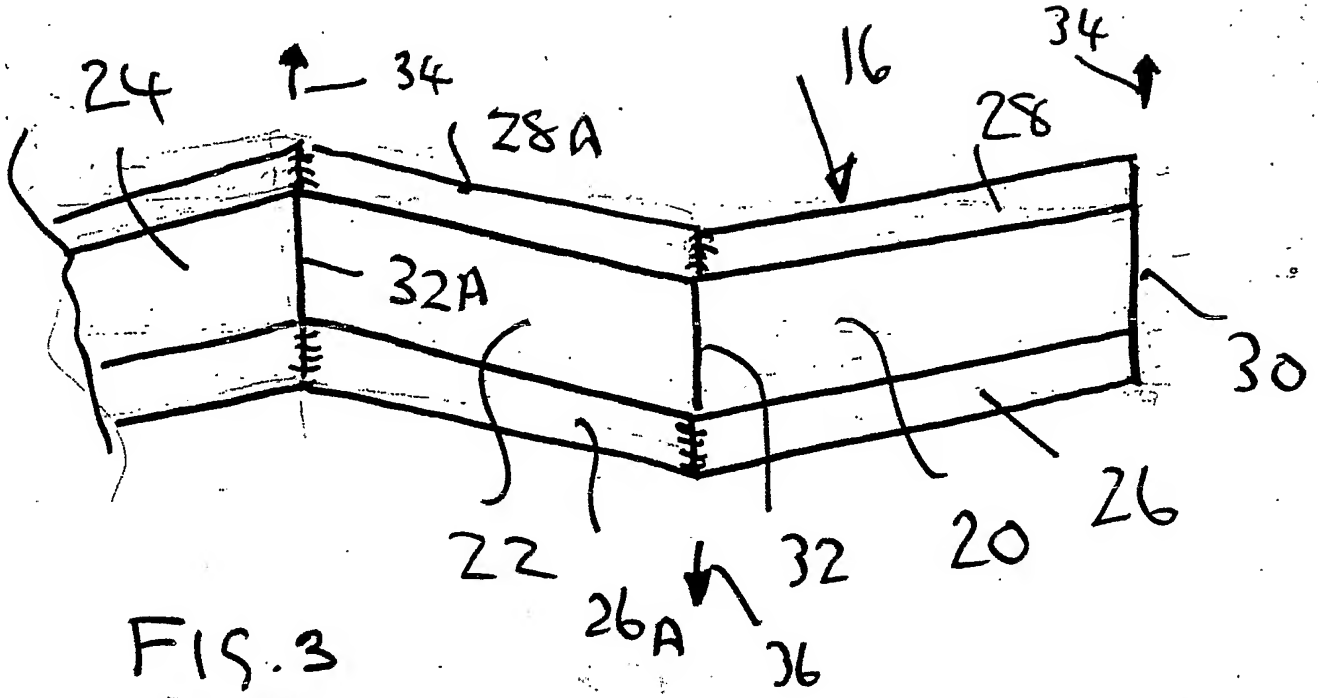

FIG. 3

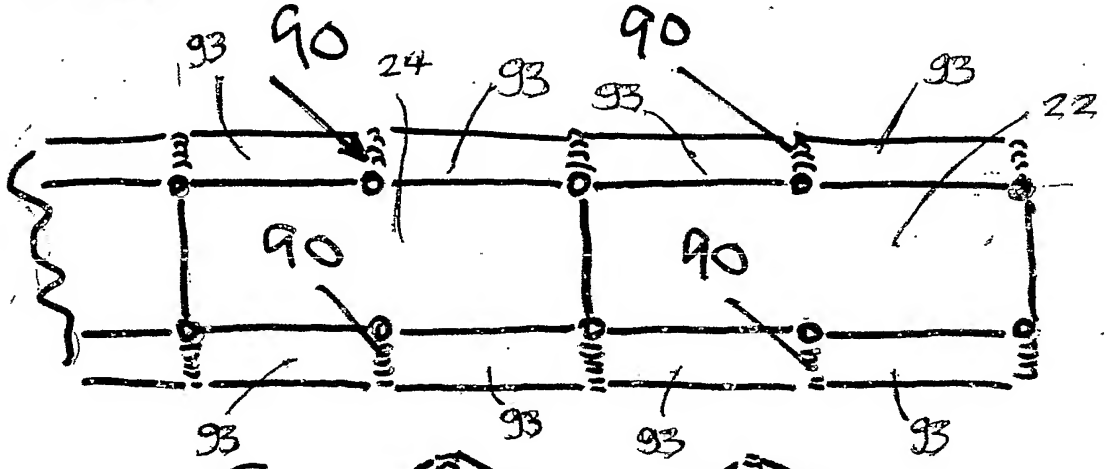

FIG. 11

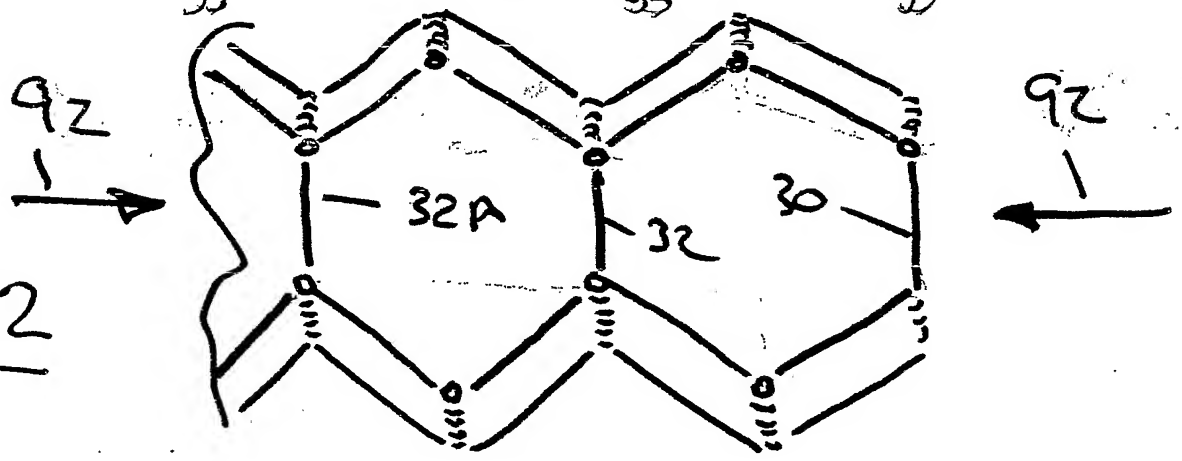

FIG. 12

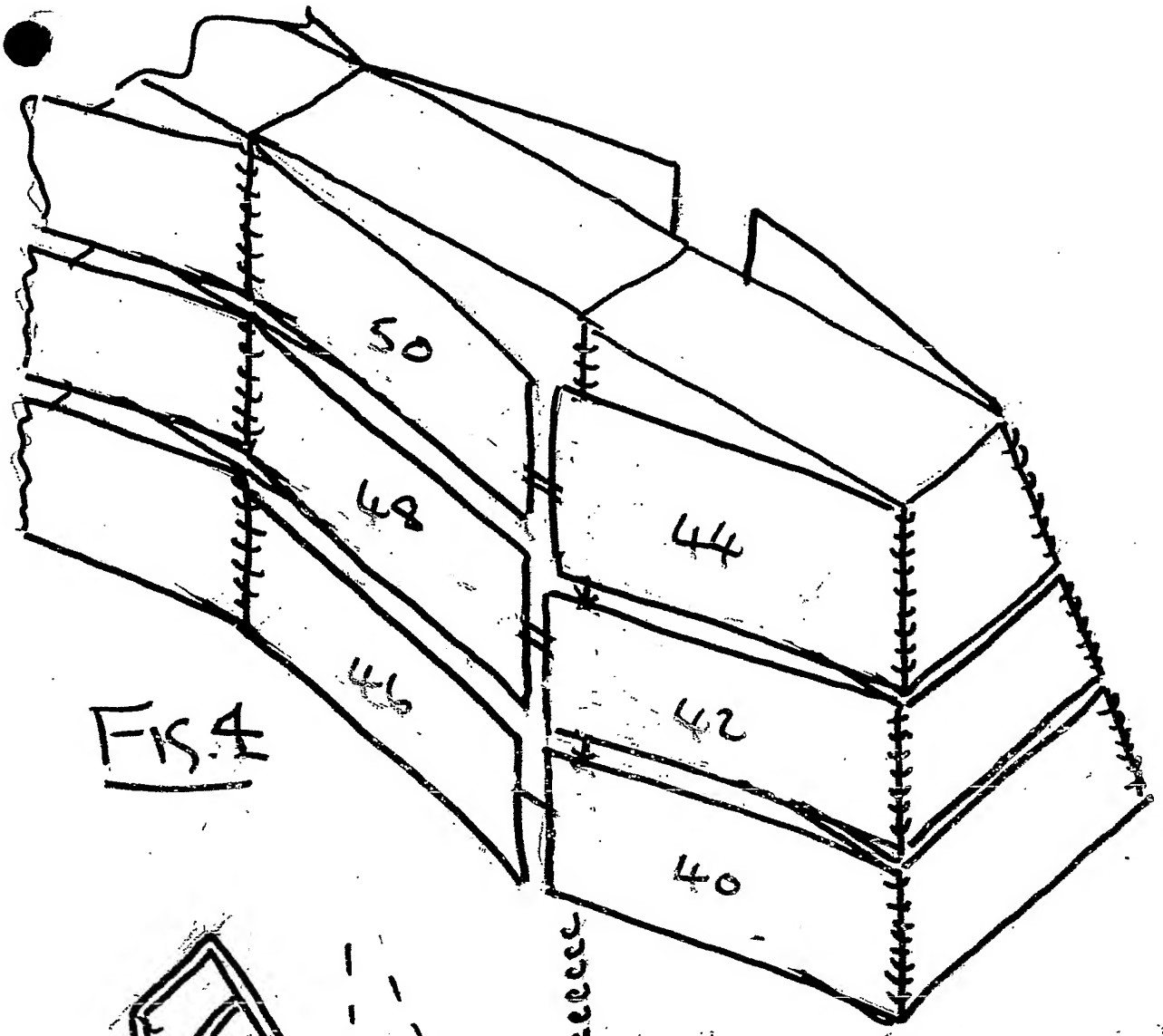

FIG. 4

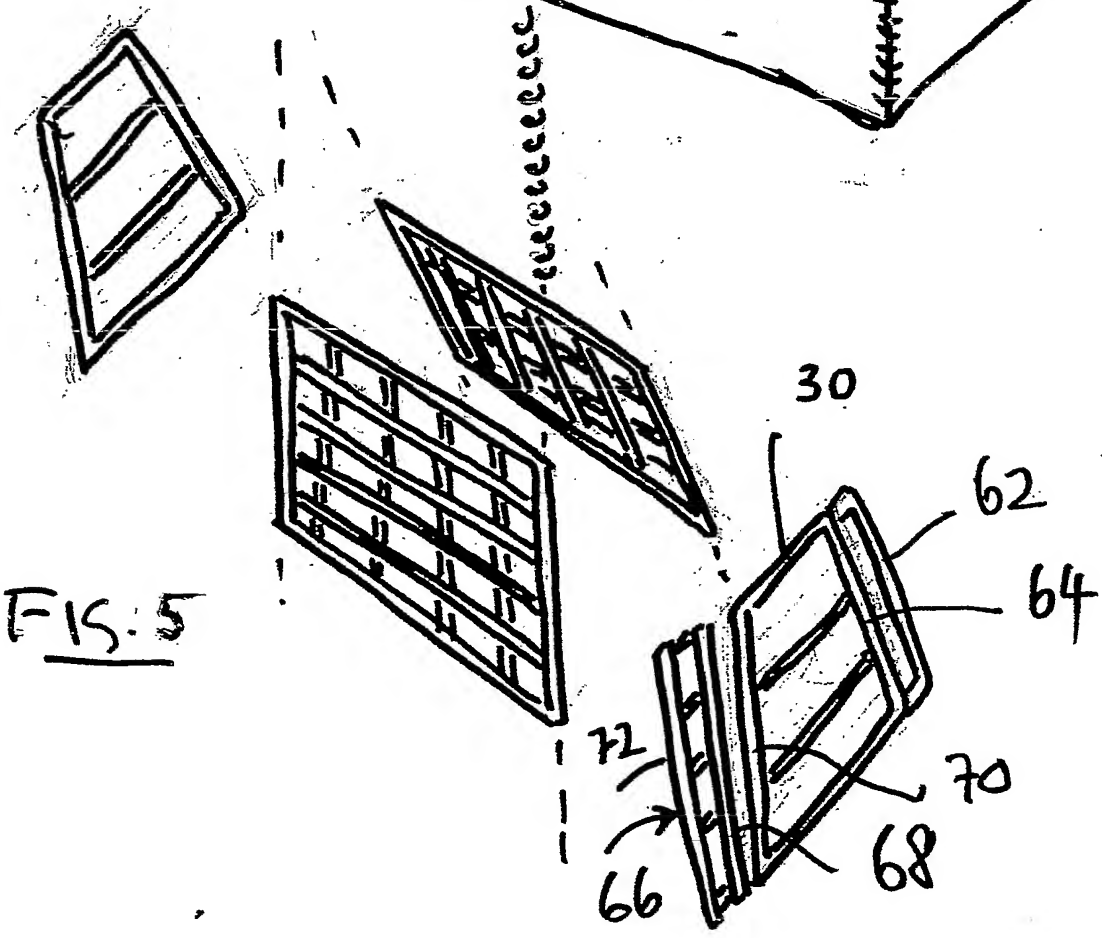

FIG. 5

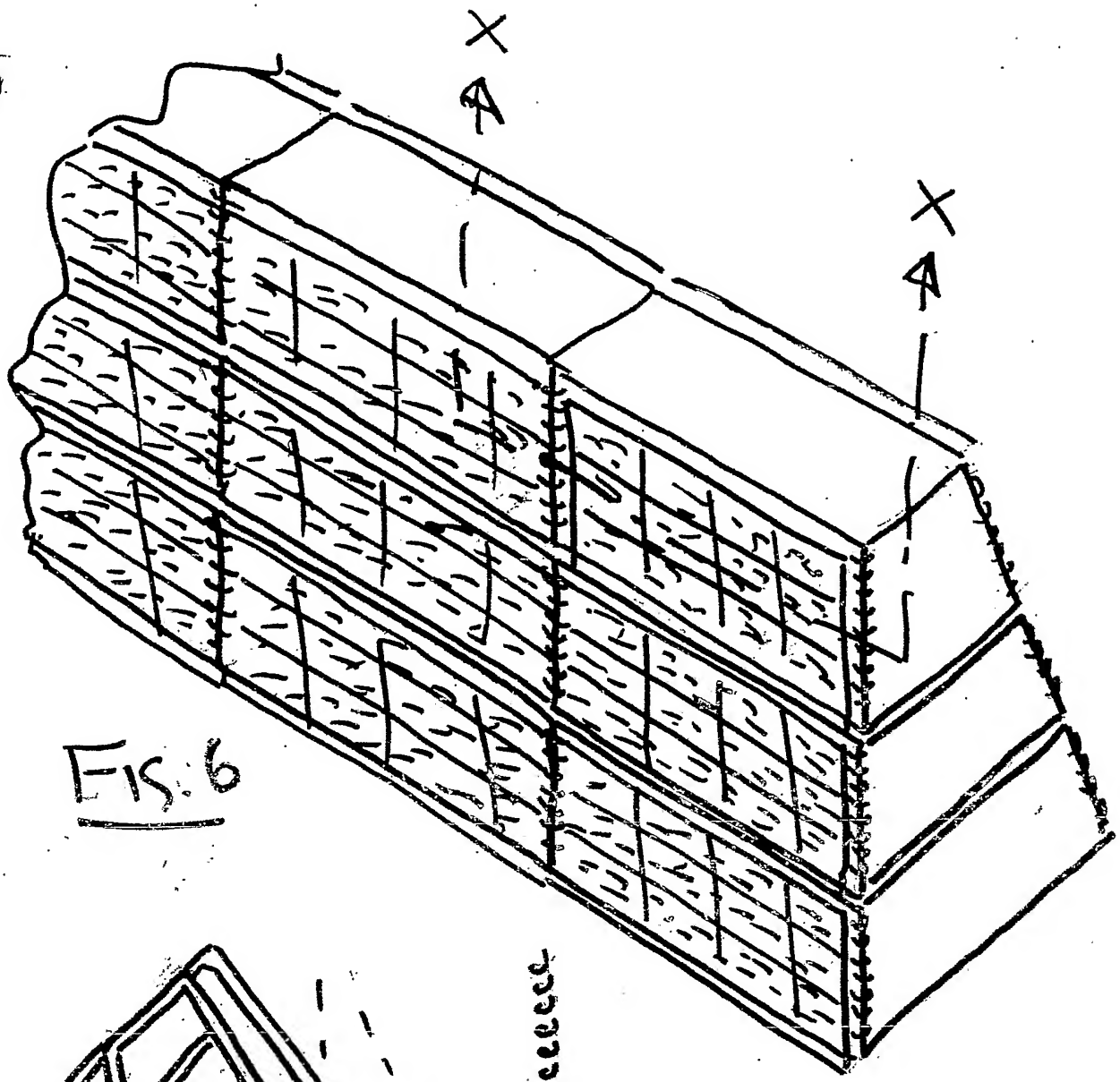

FIG. 6

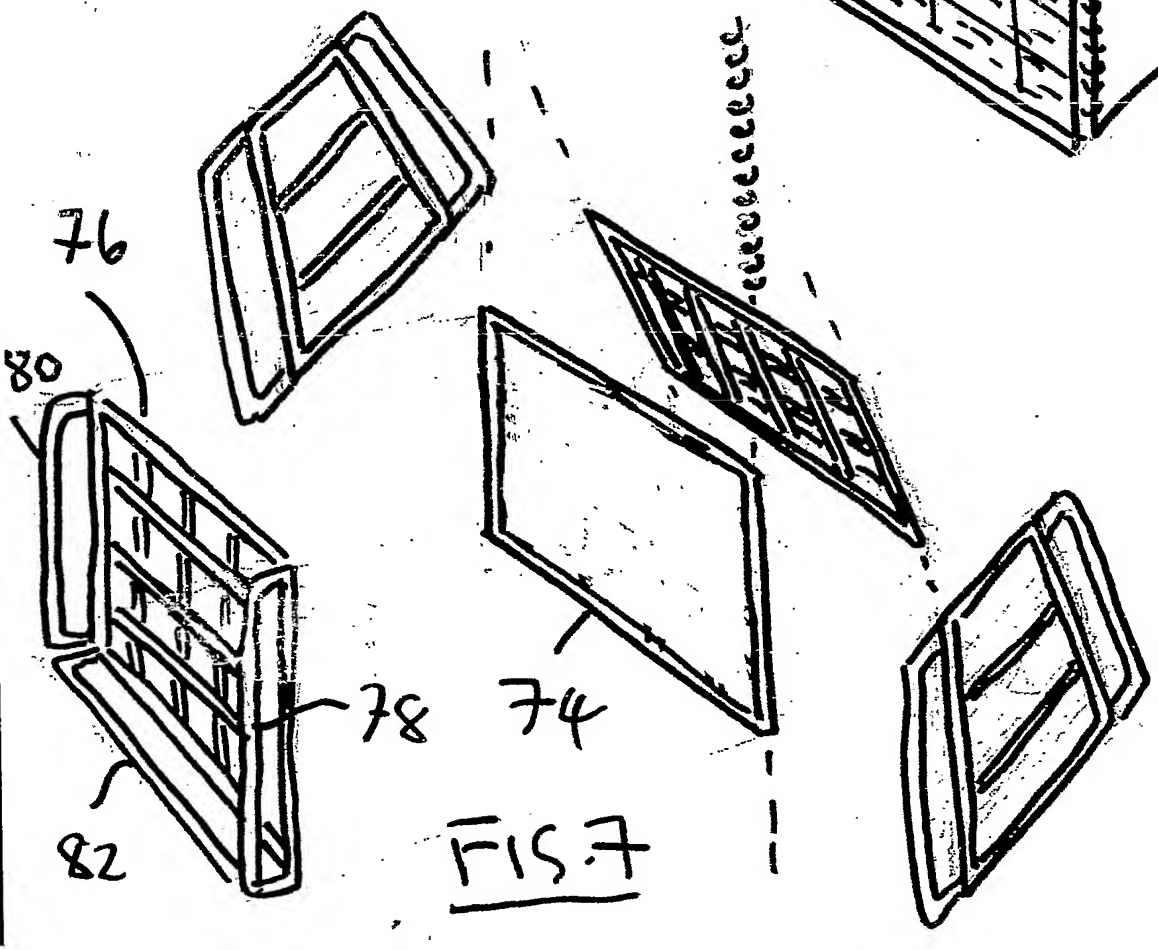

FIG. 7

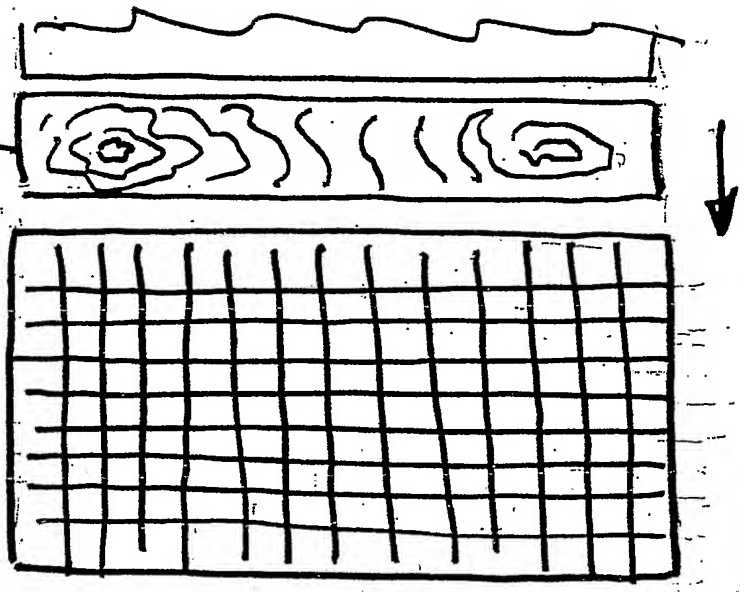

FIG. 9

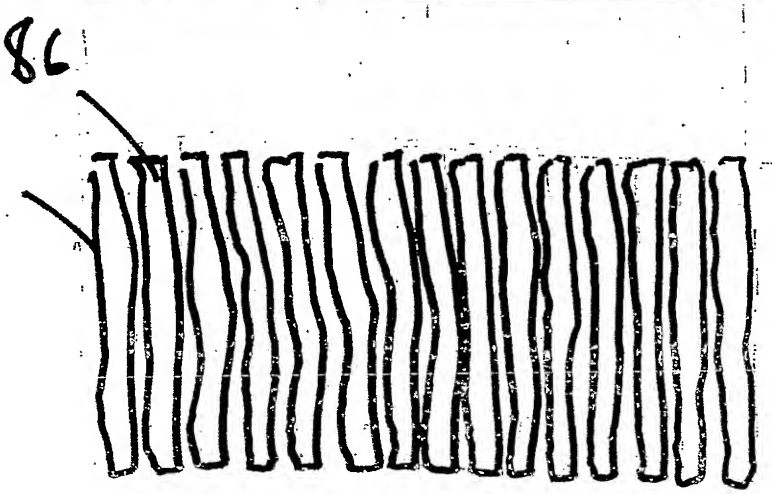

FIG. 10

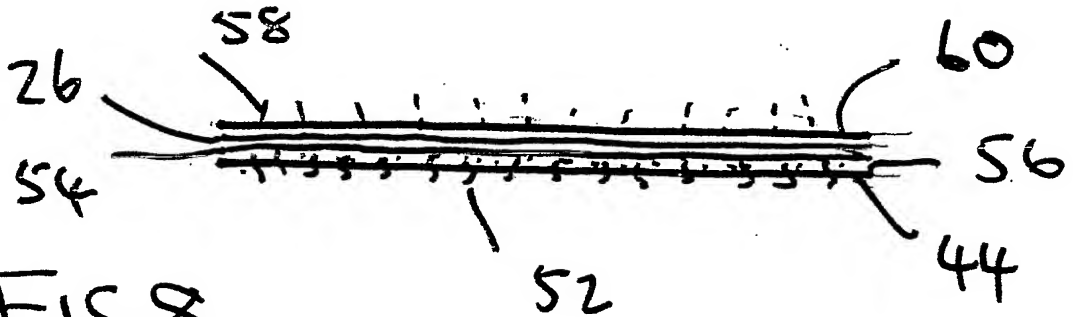

FIG. 8